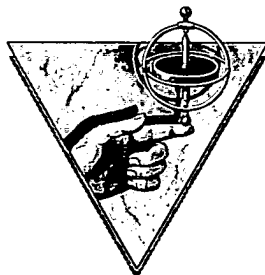


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## EQUIPMENT REPORTS

### IN YOUR EAR!

Wes Phillips listens to  
Etymotic Research's ER-4S Canal Phone earspeakers

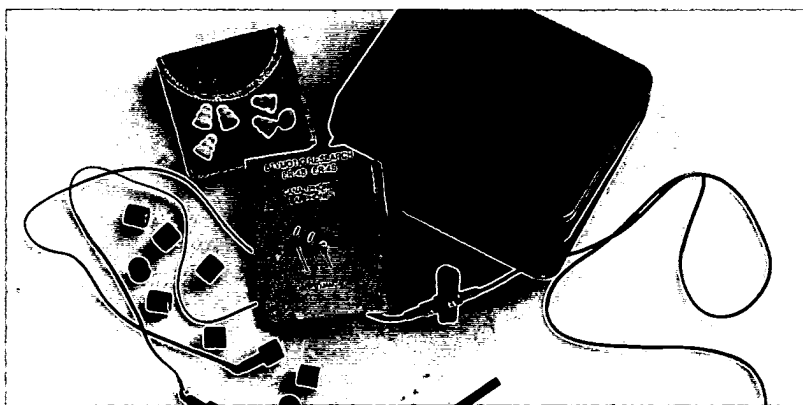
Dynamic, diffuse-field-response, in-the-ear-canal transducer. Transducer principal: dynamic diaphragm. Frequency response: 20Hz-16kHz  $\pm 4$ dB, 50Hz-10kHz  $\pm 2$ dB. 1kHz sensitivity: 108dB spl for IV input, 98dB at 1mW. Impedance: 100 ohms, nominal. Maximum output: 115dB spl. Maximum safe continuous input: 3V. Weight: <28gm (oz). Acoustic polarity: positive (acoustic and electric). Cord length: 4' with  $\frac{1}{8}$ " stereo

phone plug. Accessories included:  $\frac{1}{4}$ " phone-plug adapter, filter-changing tool, four filters, four extra eartips, shirt clip, carrying pouch. Serial numbers of units reviewed: 1272, right-channel module; 1201, left-channel module. Price: \$330. Approximate number of dealers: 25. Manufacturer: Etymotic Research, 61 Martin Lane, Elk Grove Village, IL 60007. Tel: (708) 228-0006. Fax: (708) 228-6836.

**T**he cab's outside, the plane leaves in 50 minutes. Let's see... *HeadRoom Supreme*, portable CD player, CDs, Etymotic ER-4S Canal Phones... Oh, yeah—mustn't forget luggage or plane tickets. Guess I'm set to go.

Laugh if you will at my priorities, but I'm much likelier to leave on a trip without my suitcase or my tickets than without a pair of Etymotic's unique "headphones." After all, what's more important: clean underwear or good music? Okay, okay—I'd rather have both, but what's personal hygiene compared to musical ecstasy?

The Etymotic Research ER-4S Canal Phone earphones are unlike any other "headphone" you're likely to have experienced. First, note their designation as "canal phones." It's accurate—these babies fit tightly inside your ear canals, aiming directly at your eardrums from millimeters away. The result—if the ear-tips are properly seated in the canal, creating a tight seal—is profound bass, direct and distortionless response, and phenomenal isolation from environmental noise. Etymotics are essential tools for travel, although I don't tend to use them at home, since I find the Sennheiser HD-580s (reviewed in December '94) far



Etymotic Research ER-4S Canal Phone earspeakers

more comfortable. Also, I generally *want* to hear environmental sounds such as ringing telephones or doorbells at those times.

However, whenever I take a trip, the ER-4Ses, my *HeadRoom Supreme*, and a portable CD player are the first things I pack. The noise-canceling feature of the Etymotics helps combat the fatigue of high-ambient-noise environments—such as airplane or train compartments—

and I can get a lot of very-high-quality listening done during transit. Not that I like them because they make me "efficient"—I'm a great believer in creatively wasting time—I just want to waste time doing what I like, not what I'm forced to.

And that's the real reason I love the ER-4Ses: they allow me to control when and where I listen to music. Besides, as much as I love my Sennheisers, their open-back design makes them impractical out in the world: my seat compan-

ion would receive far too much of my music—not to mention *my* receiving far too much background noise—and I'd feel like a dork walking around with a big ol' pair of cans on my head.

### EAR! EAR!

The Etymotic ER-4Ses are as compact as headphones can get—at least until we have direct neural stimulation. In fact, it almost looks like the wiring harness for a headset, lacking the earpads themselves. Sony's Fontopid ear-buds are the closest analog, but do not be misled (*mizzled*, captain?)—rather than resting in the outer ear like the Sonys, these babies get shoved into the canal itself and end up with the transducer fractions of an inch away from the eardrum.

The capsules containing the transducer are inserted into small soft plastic "ear-molds"—flanged, conical tips that resemble nothing so much as the Civil War "minnie balls" that my friends and I used to scavenge from old battlefields. The acoustic seal created by these flexible tips simultaneously isolates the listener from the environment *and* couples the transducer to the eardrum, effectively reinforcing low-frequency response. *Important end-user tip:* Failure to properly seat the earmold results in shrill sound that's totally lacking in body.

The Etymotic has a stiff 4' cable terminating in a 1/8" stereo miniplug, and it comes with a 1/8"-1/4" adaptor. Included with the 'phones are three pairs of the plastic ear-molds, as well as five pairs of open-cell foam cylinder molds—designed to sit in the outermost portion of your ear canal—for those with an aversion to placing foreign objects in their ear canals.

You also get a filter-replacing tool. *Wha zat?* Well, in the tips of the Etymotic's ear pieces—housed under the ear molds—are itty-bitty replaceable filters. Keep in mind that once you've sealed your ear with the flanged ear-molds, you've got a passage with an ambient temperature of about 100°, and even in meticulously maintained ears like yours—and mine, too, of course—there's a certain amount of, uh, *wax*. This will liquefy and migrate, so Etymotic provides a replaceable trap—the filters—to capture the wax and prevent it from fouling the transducer itself.

But that's not *all* it does. It also serves as part of the equalization curve that matches the acoustic impedance inside your ear to that of freefield response, where dispersion "softens" HF response. Take out the filter and listen—as Tyll Hertsens of HeadRoom suggested I do—and *man!* the shrillness will take the top of your head off. The filter-replacing tool has a hollow compartment that holds additional filters—just be careful when you open it or you'll be down on your hands and knees, shining a flashlight along your floorboards, trying to find the strays. Like I was.

### WHERE? WHERE?

Etymotic has been making high-quality transducers since 1983, and Mead Killion, the president of the company, has been active in the field of earphones and hearing aids for more than two decades. Killion holds patents on more than 18 different headphone and hearing-aid advances, including the K-AMP amplifier, which revolutionized hearing-aid design.

The ER-4, in fact, is an extension of the design of the Tubeophone insert earphone, designed for audiometric research. This device—which placed the transducers in a pack that connected to the ear canal via a 12" hollow tube—featured good crossfield isolation, wide frequency response, and flat diffuse-field reference response. Flat diffuse-field response means that the eardrum-pressure response of the transducer is equivalent to that in a diffuse soundfield—where sound arrives from all directions, favoring none. Multiple changes were rung upon the pattern of the Tubeophone, some for hearing research, some for the military—these adaptations were employed in several programs developing "heads-up" instrument packages for fighter pilots—before Etymotic determined to make some low-impedance prototypes. One of these wound up in Ed Long's April '91 review in *Audio of Stax's Lambda Pro* electrostatics, where he concluded that the ER-1Ms would be the headphones that he would buy—if only they were available.

Several months later, the ER-4B was on the market. What's the difference between the '4B and the '4S? The simplest answer—the one Etymotic gives—is that the '4B is designed for binaural use and the '4S for stereo. It is true that binaural recordings have an apparent dip in high-frequency response and may benefit from a slightly brighter presentation, but I've listened to binaural material on the ER-4Ses and can't really advocate tipping up the top end any more than they already do. Tyll Hertsens—a headphone maven if ever there was one—suggests that the ER-4B was simply a first draft and that Etymotic responded with the ER-4S because of the near-universal response, "*They're too bright!*" Maybe so, although Ed Long did prefer the ER-4Bs himself, while feeling that rock'n'rollers might prefer the ER-4Ses, because most rock records have too much sparkle to begin with. (The punk in me wants to snarl back, "Yeah, and most old fogeys don't have much high-frequency hearing left, either!" But since I'm mature and fair-minded, let's just leave it as a matter of taste.)

Your reaction to the Etymotics will very likely hinge upon how tolerant you are of putting something deep into your ear. I don't mind, really. My wife hates them—I've learned not to say *hey, check this out!* while traveling, because she just won't. If you intend to use them for long

periods of time, or if you do a lot of traveling, you can have custom earmolds made at a cost of about \$100. Most companies that service hearing aids can do this for you, and Etymotic can recommend specific firms in most areas.

You do want to be cautious whenever you introduce foreign objects into your ear, so be careful placing the earmolds into the canal. You should also be aware that the ear canal is relatively sensitive—the more you adjust the position of the ER-4Ses, the more likely you are to cause irritation.

### THERE! THERE!

Is all of this worthwhile? Absolutely. Properly seated in the canal, the ER-4Ses are capable of bass response better than many loudspeakers. The coupling is crucial; if not properly seated, their sound will be anemic. Get it right and the bass is full—flat to 40Hz, and probably only down about 3dB at 20Hz! Granted, you don't get the physical sense of slam that you do with a speaker system; but even so, you have *no idea* how giddy this sort of low-frequency information can make you when you're cruising at 42,000'. When I reviewed the Sennheiser HD-580s, I wrote about how silly I became listening to the deep bass-drum on the Dirty Dozen Brass Band's "Jungle Blues," from *Jelly* (Columbia CK 53214, CD). Back home in Charlottesville, I had my old friend Jimmy Jet listen to the track through the ER-4Ses.

"It's kind of tinny!" he shouted to those of us not wearing headphones.

"Push them in further," I pantomimed back.

"Wow!"—eyes widening in amazement. Wow indeed.

But these aren't one-trick ponies. The sound overall is vivid and transparent. Pierre Sprey of Mapleshade, the audiophile recording company, claims that much of the clarity and impact of his productions is due to his custom PZM microphones, which feature capsules with tiny diaphragms—less mass to push, you know. It makes sense; certainly when I listen to his remarkable recordings I'm inclined to believe anything he says on the subject.

Well, the ER-4Ses benefit from that *in reverse*. These babies are fast! Kendra Shank's *Afterglow* (Mapleshade 02132 CD) perfectly illustrates both Sprey's talent and the ER-4Ses' ability to bring it to life. This CD is one of the most realistic vocal albums I've ever heard—Shank sounds alive and embodied, as physical as breath. Her band, which consists of Larry Willis on piano (a Steinway Model O), Steve Novosel on bass, and Steve Williams on trap-set, is joined by Gary Bartz on alto sax for "Paris Bossa." All of the signifiers are there: the sheen of brass on Williams's cymbals (and silver from the triangle); the creaking of Willis's piano bench; the breathiness of Bartz's sax; the slight catch of Shank's voice.

And, I should add, the 24dB reduction in room noise makes them seem even more present than when listening on my main system. I almost wrote "so real it's eerie," but "awe" is truer to my response.

Still and all, you give nothing up in terms of sheer power—if that's what you're looking for. Frequently (*very* frequently), that's exactly what I'm looking for, and then I pull out Corigliano's *Symphony 1* (Erato 61132-2, CD), with the Chicago Symphony Orchestra under Barenboim. This superb recording features orchestral *tutti*s capable of blowing the roof off a concert hall, interspersed with melodies heard from a distance, as if in memory. *Holy guacamole*, how can they fit all of that inside my head? The power and the majesty of the CSO at full-tilt boogie is portrayed to perfection by the ER-4Ses, but never at the expense of the quiet (offstage) piano and cello reveries.

In fact, this is probably a good time to caution all headphone listeners—but most especially those using transducers capable of as much power as the Etymotics—to be really, *really* careful about listening at extreme volume. Etymotic, because of their experience in the hearing-aid industry, can actually give specific guidelines, and they point out that there are limits to the amount of time you can *safely* listen at high outputs—limits that change drastically based on loudness.

For example, they cite 16 hours/day as the safe limit for listening at 85dB, but only *one half hour* for 110dB! Having said that, I should also point out that, by the nature of the ER-4S's ambient noise reduction—spec'd at 24dB by the company, which feels about right—one tends

to listen to the Etymotics at lower levels. As a city dweller, I've measured my own listening environment as having an ambient noise level of 35–42dB, so it's probable that I actually listen to music at much lower levels through the ER-4Ses.

#### THE SUM OF ALL OUR EARS

I do have a couple almost petty caveats, but they do belong in any discussion of these 'phones. The first concerns the stiff, *very* microphonic cabling used in the ER-4Ses. As it rubs against your clothing or bumps into objects, it transmits every sound with remarkable clarity straight into your head—and through bone conduction directly into your ears. It can get awfully loud in there. Etymotic supplies you with a clothing clip, and I strongly encourage any ER-4 listener to very carefully dress the cable to minimize contact with buttons, zippers, and other potentially percussive objects.

My second warning concerns snacking: you wouldn't believe how noisy eating potato chips can be while wearing the ER-4Ses! *Wow, you won't do that a second time.* Actually, it's not just brittle foods that can intrude on your sonic landscape; swallowing liquids, heavy breathing, and everyday borborygmus can become quite audible when the outside world is reduced by 24dB. Lastly, while I didn't find the Etymotics uncomfortable, neither was I ever unaware of their presence in my ear canals. For comfortable, in-home listening, I still prefer my Sennheiser HD-580s by a very wide margin; they compare favorably sonically, as well.

However, there are situations in which the Sennheisers—and practically every

other high-end headset out there—just won't function at their optimum. These include high-noise environments, situations in which the sonic bleed-through of open-backed designs is undesirable, and times when, because of physical activity, normal headsets would become dislodged. For recording engineers, I think the ER-4Ses would be an indispensable tool—isolation plus accuracy make a difficult combination to top. For travelers, I can't recommend *anything* more highly. They help me arrive more rested—through the reduction of rumble—and in a great mood, since I've amused myself on my journey.

I've spoken to folks who use them while vigorously working and working out, and *they* all rave about them—although I wouldn't recommend them to joggers or bicyclists, because they're *too* good at isolating you from your environment to be considered safe. If I have any quibble about them, it concerns long-term comfort, and that problem can seemingly be solved—although at a cost of \$100 or more—by having custom ear-molds made. (I'll try this and get back to you.)

If you're looking for high-quality headphones for home listening, the Etymotic ER-4Ses deserve to be included on your short list. They're accurate, transparent, and fast—and, properly seated, capable of bone-jarring bottom-end.

If you're not planning on staying home, though, and want to take high-quality listening into places where it just hasn't been possible before—well, I'm not even sure you have another choice. It really is that simple. **S**